

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) An electromagnetic driving device comprising;
a movable core,

a stator having a housing portion for housing said movable core in such a manner as to move in a reciprocating fashion therein, and an attaching portion, ~~between which and said movable core~~ a magnetic force is being generated between said attracting portion and said movable core for attracting said movable core to move in one of reciprocating movement directions direction and cooperating with said movable core to form a magnetic circuit,

a coil for generating a magnetic force which attracts said movable core to said attracting portion side when energized, and

a non-magnetic layer formed on at least one of sides where said housing portion and said movable core are situated, respectively, to diametrically face each other,

and wherein an eccentricity R defined as $(d_1/d_0) \times 100$ is set so as to satisfy $20\% \leq R \leq 60\%$, ~~when where d_0 is a magnetic gap which is formed in a radial direction between the housing portion and the movable core and excludes core, excluding the non-magnetic layer, layers is defined as d_0 and d_1 is an air gap which is formed in a radial direction between the facing surfaces of the housing portion and the movable core and includes core, including the non-magnetic layer, layers when the movable core does not deviate from, but remains coaxial with, the housing portion. portion defined as d_1~~

~~and wherein any of said attracting portion, said housing portion and said plunger portion becomes saturated magnetically when the value of electric current that is supplied to said coil increases to reach a predetermined value which falls between 40% or larger and 60% or smaller of a maximum value of electric current that is supplied to said coil.~~

2. (original) An electromagnetic driving device as set forth in claim 1, wherein a non-magnetic layer is formed on at least one of sides where said housing portion and said movable core are situated, respectively, to diametrically face each other, and wherein the total thickness of said non-magnetic layer so formed falls between 40 μ m or larger and 80 μ m or smaller.

3. (previously presented) An electromagnetic driving device as set forth in Claim 1, wherein the hardness of at least one of sliding surfaces of said housing portion and said movable core is made equal to or larger than HV200, and wherein a difference in hardness between said sliding surface is equal to or smaller than HV300.

Claims 4 and 5. (canceled).

6. (withdrawn) An electromagnetic driving device comprising;
a movable core,
a stator having a housing portion for housing said movable core in such a manner as to move in a reciprocating fashion therein and an attaching portion between which and said movable core a magnetic force is generated for attracting said movable core to one of reciprocating movement directions and co-operating with said movable core to form a magnetic circuit, and
a coil for generating a magnetic force which attracts said movable core to said attracting portion side when energized, wherein
the hardness of at least one of sliding surfaces of said housing portion and said movable core is made equal to or larger than HV200, and wherein a difference in hardness between said sliding surfaces is equal to or smaller than HV300.

7. (withdrawn) A flow rate controlling apparatus comprising;
a housing having a plurality of fluid paths which penetrate through a cylindrical circumferential wall,
an electromagnetic driving device as set forth in Claim 1,

a movable member adapted to reciprocate together with said movable core to thereby control the flow rate of fluid flowing through said fluid paths, and

biasing means for biasing said movable member in a direction opposite to a direction in which said movable core is attracted by said attracting portion.

8. (new) An electromagnetic driving device as set forth in claim 1, wherein a thin portion is formed between the housing portion and the attracting portion, said thin portion defining a magnetic resistance portion for reducing a leakage of magnetic flux between the housing portion and the attracting portion.

9. (new) An electromagnetic driving device as set forth in claim 1, wherein a first non-magnetic layer is formed on an inner circumferential wall of the housing portion and a second non-magnetic layer is formed on an outer circumferential wall of the movable core, said air gap being formed in a radial direction between said first and second non-magnetic layers and said magnetic gap being formed between magnetic materials of the housing portion and the movable core.

10. (new) An electromagnetic driving device as set forth in claim 1, wherein said non-magnetic layer comprises a layer selected from the group consisting of a teflon coating, a coating comprising a combination of polyamide and teflon, a coating comprising a combination of polyamide and molybdenum disulfide, and NiP plating.

11. (new) An electromagnetic driving device as set forth in claim 1, wherein if said first non-magnetic layer has a thickness t_0 and the second non-magnetic layer has a thickness t_1 , the thicknesses are set so as to satisfy $40\mu\text{m} \leq t_0 + t_1 \leq 80\mu\text{m}$.

12. (new) An electromagnetic driving device as set forth in claim 1, wherein any of said attracting portion, said housing portion and said plunger portion becomes saturated magnetically when the value of electric current that is supplied to said coil

increases to reach a predetermined value which falls between 40% or larger and 60% or smaller of a maximum value of electric current that is supplied to said coil.

13. (new) An electromagnetic driving device as set forth in claim 1, wherein the non-magnetic layer is formed on one of the housing portion and the plunger and has a thickness ranging between 40 μ m and 80 μ m.

14. (new) An electromagnetic driving device as set forth in claim 1, wherein a slight nitriding is applied to the stator core so as to increase a hardness of an inner circumferential surface of said housing portion to the order of HV600 and wherein the hardness of the outer circumferential surface of said movable core is increased to the order of HV900.

15. (new) An electromagnetic driving device as set forth in claim 1, wherein a difference in hardness between the sliding surfaces of the housing portion and movable core is HV300 or smaller.